



NOTES

ORTHOMYXOVIRUSES

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- *Associated clinical syndromes:* influenza ("the flu"), pneumonia
- RNA virus family; causes acute respiratory disease

Genetic material

- Negative-sense, single-stranded RNA

Taxonomy

- Genera
 - *Influenza A, Influenza B, Influenza C:* infect humans
 - *Influenza D, Isavirus, Thogotovirus, Quarantivirus*
- Classified by surface protein
 - *Influenza A, B:* hemagglutinin (H) (glycoprotein, allows progeny release); neuraminidase (N) (lectin; binds to host cell through sialic acid residues)
 - *Influenza C:* hemagglutinin esterase fusion (F) (binds to host cell)

Morphology

- Enveloped (outer lipid membrane)
- Spherical/filamentous
- Size: 50–120nm

SIGNS & SYMPTOMS

- Fever, malaise, myalgia, sore throat, non-productive cough

DIAGNOSIS

- Clinical examination

DIAGNOSTIC IMAGING

X-ray

- Chest

CT scan

LAB RESULTS

- Molecular assays
- Viral culture

TREATMENT

MEDICATIONS

- Antiviral therapy

VISIT...

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INFLUENZA VIRUS

osms.it/influenza

PATHOLOGY & CAUSES

- Single-stranded RNA virus; causes acute respiratory disease
- AKA “the flu”
- Incubation: 1–4 days

Pathogenesis

- Influenza virus penetrates upper respiratory tract → **hemagglutinin** binds to epithelial cell **sialic acid** residue → **endocytosis** → viral replication → **neuraminidase** releases progeny → viral infection spreads
- Viral shedding (progeny release)
 - Duration: average 4–8 days
 - Magnitude: ↑ symptoms = ↑ shedding
- Influenza A antigen variations → immune evasion, reinfection
 - **Antigenic shift**: major changes in H/N proteins (two different influenza virus genome segments reassort) → epidemic/pandemic
 - **Antigenic drift**: minor changes in H/N proteins (mutation in H/N gene) → outbreak

Taxonomy

- **Nomenclature**: [type] / [original host] / [location of first identification] / [strain number] / [year of origin] ([subtype])
 - Host type, subtype included in influenza A viruses only
 - E.g. H1N1 type A flu virus of duck origin, found in Alberta, Canada, 35th strain, found in 1976 → A/duck/Alberta/35/76(H1N1)

Transmission

- Direct contact, airborne droplets, fomites

Outbreak

- Abrupt
- Winter; year-round in tropical regions
- Duration: 2–3 months

Pandemics, associated strains

- 1918 “Spanish flu” → H1N1
- 1957 “Asian flu” → H2N2
- 1968 “Hong Kong flu” → H3N2
- 2009 (worldwide) → H1N1

RISK FACTORS

- Immunosuppression, age ≥ 65 years, age < six months, nursing/chronic care facility resident, pregnancy, chronic disease, morbid obesity

COMPLICATIONS

- Secondary bacterial infection (e.g. pneumonia, sinusitis, otitis media, bronchiolitis), acute respiratory distress syndrome, myositis, rhabdomyolysis, myocarditis, pericarditis, encephalitis
- Secondary **bacterial infections** generally due to *Streptococcus pneumoniae*

SIGNS & SYMPTOMS

Uncomplicated influenza

- **Systemic**: fever, malaise, myalgia, headaches, weakness, dizziness
- **Respiratory**: non-productive cough, sore throat, nasal secretion
- Mild cervical adenopathy

Complicated influenza

- **Primary influenza pneumonia**: fever, dyspnea, cyanosis
- **Secondary bacterial pneumonia**: fever, cough, purulent sputum

DIAGNOSIS

- Clinical examination, during outbreak

DIAGNOSTIC IMAGING

X-ray

- chest

CT scan

- *Primary influenza pneumonia*: bilateral reticular/reticulonodular opacities, sometimes consolidation
- *Secondary bacterial influenza*: pulmonary infiltrates

LAB RESULTS

- *Respiratory tract specimen molecular assay*: reverse-transcriptase polymerase chain reaction (RT-PCR)
- Rapid antigen test: immunoassay
- Respiratory tract specimen viral culture

TREATMENT

MEDICATION

- Severe illness/risk factors → antiviral therapy
 - Neuraminidase inhibitors; H1N1 commonly resistant
 - M2 proton channel inhibitors; active against influenza A only
- *Symptomatic treatment*: acetaminophen, non-steroidal anti-inflammatory drugs (NSAID)
- *Secondary bacterial infection*: antibiotics

OTHER INTERVENTIONS

- Hydration

Prevention

- Vaccine
 - *Inactivated* (intramuscular/intradermal)/*live attenuated* (intranasal); trivalent/quadrivalent (2 influenza A antigens + 1/2 influenza B antigens); annual, single-dose application (*before winter*); age ≥ six years
- Antiviral prophylaxis (high-risk individual)
 - Neuraminidase inhibitors
- Infection control
 - E.g. hand hygiene, face mask

INFLUENZA VIRUSES OVERVIEW

	INFLUENZA A	INFLUENZA B	INFLUENZA C
HOST	Human, mammal, bird	Human, seal	Human, pig, dog
FREQUENCY	Most common	Less common	Least common
RNA SEGMENTS	8	8	7
COMMON SUBTYPES	H1N1, H3N2	No subtypes	No subtypes
ANTIGEN VARIATION	Frequent	Rare	Rare